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Vocal accommodation in common marmosets: Does similarity buffer tension during pair bond development?

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Abstract

Affiliative relationships in animals are often based on similarity which can facilitate understanding and prediction of the behavior of the social partner (Capitanio et al., 2017; Massen and Koski, 2014; Morton et al., 2015; Weinstein and Capitanio, 2008). Similarity can influence the preference for a partner also in humans, and facilitate cooperation within a dyad. For instance, similarity in vocal dialect seems to increase cooperativeness in humans (Cohen and Haun, 2013; Heblich et al., 2015; Richerson et al., 2016).
Vocal accommodation occurs when communication partners adjust their vocalization or speech to a current interaction partner and can provide information about the social relationship between partners. It can take the form of convergence, when communication partners with a strong social bond become more similar, and therefore indicate social closeness. Alternatively, it can take the form of divergence, when partners' vocalizations become less similar, indicating social distance (Ruch et al., 2017). Since both humans and nonhuman primates appear to preferably interact with others that are similar to oneself (i.e. show homophily, (Haun and Over, 2015)), vocal accommodation may enhance group cohesion and buffer negative effects of vocal difference. The phenomenon of vocal accommodation is well studied in humans but less is known about it in nonhuman primates.

Callithrichids are highly vocal monkey species, and different populations show colony specific vocal differences (de la Torre and Snowdon, 2009; Zürcher and Burkart, 2017). Like humans, but unlike more closely related great apes, callitrichids are cooperative breeders and mothers strongly rely on help form their partners and other group members to raise offspring (Snowdon and Cronin, 2007; Snowdon and Ziegler, 2007). In callitrichid common marmoset *(Callithrix jacchus)* breeding pairs, pair bond strength correlates with cooperation in infant care (Finkenwirth, 2016). Furthermore, common marmoset pairs and their offspring show considerable behavioral similarity (group-level personalities that are independent of genetic relatedness: (Koski and Burkart, 2015)). Together, this suggests that it may be favorable for marmosets to be similar to their partners. However, choosing a similar mate may often not be possible due to limited

availability of potential partners. In these cases, the ability to *become* more similar to a new mate would be beneficial.

Our goal was to investigate whether acoustic similarity improves pair bond formation in common marmosets, and whether they engage in vocal accommodation to reduce vocal distance. First, we expected that individuals with more similar vocalizations would develop a stronger pair bond than animals with different vocal dialects. To test this, we formed 10 new breeding pairs, 5 with animals with the same and 5 with different vocal dialects (similar / mixed pairs respectively). We collected behavioural data to quantify bond quality, expressed as affiliation, over the time span of the first 9 weeks of pair formation. The results showed that affiliation in mixed pairs developed significantly different over time compared to similar pairs (LME, $p = 0.001$). Mixed pairs showed a decrease of affiliation over time, whereas affiliation in similar pairs stayed constantly high. Second, we expected that pairs would show vocal accommodation. We had two hypotheses about why common marmosets would accommodate to their partner: 1) to advertise the strength of their pair bond or, 2) as a mean to buffer potential negative effects of vocal dissimilarity on bond quality. In the first case, we expected a positive correlation between the amount of accommodation and pair bond, in the second, more accommodation the larger the initial vocal distance was. To investigate if common marmosets show accommodation, we collected vocalizations of all new breeding partners over the course of the pair formation process (up to 9 weeks after first introduction). We analyzed three social call types (phee calls, trill calls and food calls) and measured 16 – 18 parameters per call, depending on call type. To estimate similarity between partners, we calculated Euclidian distances between the calls of partners at different time points and compared the differences with randomized t-tests. We found accommodation both in the form of convergence and divergence, with convergence being more common. Furthermore, the results did not support hypothesis 1 because vocal accommodation did not reflect average or final pair bond strength of a pair. Rather, in support of hypothesis 2, pairs with a larger initial vocal distance showed more convergence than pairs with smaller initial distance to their partner (LME, $p = 0.001$). We therefore suggest that 1) vocal similarity at the beginning of pair formation influences how the pair bond develops and 2) that common marmosets indeed use long term accommodation as a strategy to become more similar to their partner, buffering potential negative effects of vocal distance between partners. Taken together, our results suggest that social functions of accommodation did not evolve after, but rather before the evolution of language, probably serving as a base upon which language could evolve.

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